

defined herein, the surface-modified particle has an average size from about 1 nm to about 2,000 nm, and said administration is effective in alleviating, treating, and/or preventing symptoms or pathologies associated with said disease or disorder.

[0012] Each of the aforementioned methods for treating can be effected by using cellular transport to deliver the surface-modified particles to a target tissue of the subject, or by localized administration of the surface-modified particles into a body cavity having a site of disease (e.g., cancer, infection) and/or inflammation in the subject such that the surface-modified particles can be taken up by diseased or inflammatory cells located within the body cavity.

BRIEF DESCRIPTION OF THE DRAWINGS

[0013] FIG. 1 (including FIG. 1A and FIG. 1B) provides graphs showing uptake of DSPE-mPEG2000/poloxamer 188-coated paclitaxel particles labeled with Oregon Green (No DOTAP) and DOTAP-coated paclitaxel particles labeled with Oregon Green (DOTAP).

[0014] FIG. 2 (including FIG. 2A and FIG. 2B) provides graphs showing uptake of DSPE-mPEG2000/poloxamer 188-coated paclitaxel particles (DSPE-mPEG2000/poloxamer 188), DOTAP-coated paclitaxel particles labeled with Oregon Green and stored for 3 months (DOTAP Sample 1), freshly prepared DOTAP-coated paclitaxel particles labeled with Oregon Green (DOTAP Sample 2), and protamine-coated paclitaxel particles labeled with Oregon Green (Protamine).

[0015] FIG. 3 (including FIG. 3A, FIG. 3B, FIG. 3C, FIG. 3D, FIG. 3E and FIG. 3F) provides graphs showing uptake of DSPE-mPEG2000/poloxamer 188-coated paclitaxel particles labeled with Oregon Green (No DOTAP) and DOTAP-coated paclitaxel particles labeled with Oregon Green (DOTAP). Cells were cultured for 1, 2, or 6 days prior to exposing the cells to the paclitaxel particles.

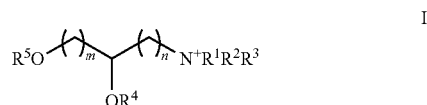
[0016] FIG. 4 (including FIG. 4A and FIG. 4B) provides graphs showing uptake of DSPE-mPEG2000/poloxamer 188-coated paclitaxel particles labeled with Oregon Green (DSPE-mPEG2000/poloxamer 188), DOTAP-coated paclitaxel particles labeled with Oregon Green (DOTAP/DSPE-mPEG2000/poloxamer 188), polylactic-co-glycolic acid-coated paclitaxel particles labeled with Oregon Green (PLGA/poloxamer 188), and phosphatidylserine-coated paclitaxel particles labeled with Oregon Green (PS/DSPE-mPEG2000/poloxamer 188).

[0017] FIG. 5 (including FIG. 5A, FIG. 5B, FIG. 5C and FIG. 5D) provides graphs showing uptake of DSPE-mPEG2000/poloxamer 188-coated paclitaxel particles labeled with Oregon Green (DSPE-mPEG2000/poloxamer 188), DOTAP-coated paclitaxel particles labeled with Oregon Green (DOTAP/DSPE-mPEG2000/poloxamer 188), and cetyl trimethylammonium bromide-coated paclitaxel particles labeled with Oregon Green (CTAB/DSPE-mPEG2000/poloxamer 188).

DETAILED DESCRIPTION

[0018] The claimed invention is susceptible of embodiments in many different forms. Preferred embodiments, as disclosed herein, are to be considered exemplary of the principles of the claimed invention and thus not intended to limit the broad aspects of the claimed invention to the embodiments illustrated.

[0019] One aspect of the invention provides a surface-modified particle comprising a particle core and a coating associated with the particle core. The particle core comprises an active agent which is typically selected from the group consisting of small molecules, peptides, and proteins, the coating comprises a surfactant having formula I:



wherein n and m are independently selected from the group consisting of 1, 2, 3, 4, 5, and 6; R¹, R², and R³ are independently selected from C₁ to C₈ alkyl; and R⁴ and R⁵ are independently selected from the group consisting of C₆ to C₄₀ alkyl, C₆ to C₄₀ alkenyl, C₆ to C₄₀ alkynyl, C(=O)(C₅ to C₃₉ alkyl), C(=O)(C₅ to C₃₉ alkenyl), and C(=O)(C₅ to C₃₉ alkynyl), and the surface-modified particle has an average size from about 1 nm to about 2,000 nm.

[0020] As used herein, the term "alkyl" refers to straight chained and branched saturated hydrocarbon groups, non-limiting examples of which include methyl, ethyl, and straight chain and branched propyl and butyl groups. Alkyl groups optionally can be substituted, for example, with one or more hydroxy ($-\text{OH}$), oxo ($=\text{O}$), halo ($-\text{F}$, $-\text{Cl}$, $-\text{Br}$, or $-\text{I}$), and thio ($-\text{SH}$) groups or a combination thereof.

[0021] As used herein, the term “alkenyl” refers to straight chained and branched hydrocarbon groups containing at least one carbon-carbon double bond, nonlimiting examples of which include straight chain and branched hexadecenyl and octadecenyl groups. Alkenyl groups optionally can be substituted, for example, with one or more hydroxy (—OH), oxo (=O), halo (—F, —Cl, —Br, or —I), and thio (—SH) groups or a combination thereof.

[0022] As used herein, the term “alkynyl” refers to straight chained and branched hydrocarbon groups containing at least one carbon-carbon triple bond, nonlimiting examples of which include straight chain and branched hexadecynyl and octadecynyl groups. Alkynyl groups optionally can be substituted, for example, with one or more hydroxy (—OH), oxo (=O), halo (—F, —Cl, —Br, or —I), and thio (—SH) groups or a combination thereof.

[0023] R¹, R², and R³ alkyl groups of formula I can have, for example, from 1 to 8 carbon atoms, from 1 to 6 carbon atoms, and/or from 1 to 4 carbon atoms. In some embodiments, R¹, R², and R³ are independently selected from the group consisting of methyl and ethyl.

[0024] R⁴ and R⁵ alkyl groups of formula I can have, for example, from 6 to 40 carbon atoms, from 10 to 24 carbon atoms, from 14 to 18 carbon atoms, from 5 to 39 carbon atoms, from 9 to 23 carbon atoms, and/or from 13 to 17 carbon atoms.

[0025] R⁴ and R⁵ alkenyl groups of formula I can have, for example, 1, 2, 3, 4, 5, 6, or more double bonds. The R⁴ and R⁵ alkenyl groups can have, for example, from 6 to 40 carbon atoms, from 10 to 24 carbon atoms, from 14 to 18 carbon atoms, from 5 to 39 carbon atoms, from 9 to 23 carbon atoms, and/or from 13 to 17 carbon atoms.

[0026] R⁴ and R⁵ alkynyl groups of formula I can have, for example, 1, 2, 3, 4, 5, 6, or more triple bonds. The R⁴ and R⁵ alkynyl groups can have, for example, from 6 to 40 carbon atoms, from 10 to 24 carbon atoms, from 14 to 18